Amdt a #6

SEQUENCE LISTING

<110> Fisher, Paul B.
Kang, Dong-Chul
Gopalkrishnan, Rahul V.

<120> USE OF MDA-5 AS AN ANTIVIRAL AND
ANTIPROLIFERATIVE AGENT

<130> A34614-A-PCT-USA-A (070050.1921)

A1

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<141> 2002-01-22

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<151> 2001-02-28

<150> 09/515,363
<151> 2000-02-29

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Leu Pro Gln Ile Leu Gly Leu Thr Ala Ser Pro Gly Val Gly Gly Ala
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Thr Lys Gln Ala Lys Ala Glu Glu His Ile Leu Lys Leu Cys Ala Asn
            500                 505                 510
Leu Asp Ala Phe Thr Ile Lys Thr Val Lys Glu Asn Leu Asp Gln Leu
        515                 520                 525
Lys Asn Gln Ile Gln Glu Pro Cys Lys Lys Phe Ala Ile Ala Asp Ala
    530                 535                 540
Thr Arg Glu Asp Pro Phe Lys Glu Lys Leu Leu Glu Ile Met Thr Arg
545                 550                 555                 560
Ile Gln Thr Tyr Cys Gln Met Ser Pro Met Ser Asp Phe Gly Thr Gln
                565                 570                 575
Pro Tyr Glu Gln Trp Ala Ile Gln Met Glu Lys Lys Ala Ala Lys Glu
            580                 585                 590
Gly Asn Arg Lys Glu Arg Val Cys Ala Glu His Leu Arg Lys Tyr Asn
        595                 600                 605
Glu Ala Leu Gln Ile Asn Asp Thr Ile Arg Met Ile Asp Ala Tyr Thr
    610                 615                 620
His Leu Glu Thr Phe Tyr Asn Glu Glu Lys Asp Lys Lys Phe Ala Val
625                 630                 635                 640
Ile Glu Asp Asp Ser Asp Glu Gly Gly Asp Asp Glu Tyr Cys Asp Gly
                645                 650                 655
Asp Glu Asp Glu Asp Asp Leu Lys Lys Pro Leu Lys Leu Asp Glu Thr
            660                 665                 670
Asp Arg Phe Leu Met Thr Leu Phe Phe Glu Asn Asn Lys Met Leu Lys
        675                 680                 685
Arg Leu Ala Glu Asn Pro Glu Tyr Glu Asn Glu Lys Leu Thr Lys Leu
    690                 695                 700
Arg Asn Thr Ile Met Glu Gln Tyr Thr Arg Thr Glu Glu Ser Ala Arg
705                 710                 715                 720
Gly Ile Ile Phe Thr Lys Thr Arg Gln Ser Ala Tyr Ala Leu Ser Gln
                725                 730                 735
Trp Ile Thr Glu Asn Glu Lys Phe Ala Glu Val Gly Val Lys Ala His
            740                 745                 750
His Leu Ile Gly Ala Gly His Ser Ser Glu Phe Lys Pro Met Thr Gln
        755                 760                 765
Asn Glu Gln Lys Glu Val Ile Ser Lys Phe Arg Thr Gly Lys Ile Asn
    770                 775                 780
Leu Leu Ile Ala Thr Thr Val Ala Glu Glu Gly Leu Asp Ile Lys Glu
785                 790                 795                 800
Cys Asn Ile Val Ile Arg Tyr Gly Leu Val Thr Asn Glu Ile Ala Met
                805                 810                 815
```

```
Val Gln Ala Arg Gly Arg Ala Arg Ala Asp Glu Ser Thr Tyr Val Leu
            820                 825                 830
Val Ala His Ser Gly Ser Gly Val Ile Glu Arg Glu Thr Val Asn Asp
        835                 840                 845
Phe Arg Glu Lys Met Met Tyr Lys Ala Ile His Cys Val Gln Asn Met
    850                 855                 860
Lys Pro Glu Glu Tyr Ala His Lys Ile Leu Glu Leu Gln Met Gln Ser
865                 870                 875                 880
Ile Met Glu Lys Lys Met Lys Thr Lys Arg Asn Ile Ala Lys His Tyr
                885                 890                 895
Lys Asn Asn Pro Ser Leu Ile Thr Phe Leu Cys Lys Asn Cys Ser Val
            900                 905                 910
Leu Ala Cys Ser Gly Glu Asp Ile His Val Ile Glu Lys Met His His
        915                 920                 925
Val Asn Met Thr Pro Glu Phe Lys Glu Leu Tyr Ile Val Arg Glu Asn
    930                 935                 940
Lys Ala Leu Gln Lys Lys Cys Ala Asp Tyr Gln Ile Asn Gly Glu Ile
945                 950                 955                 960
Ile Cys Lys Cys Gly Gln Ala Trp Gly Thr Met Met Val His Lys Gly
                965                 970                 975
Leu Asp Leu Pro Cys Leu Lys Ile Arg Asn Phe Val Val Val Phe Lys
            980                 985                 990
Asn Asn Ser Thr Lys Lys Gln Tyr Lys Lys Trp Val Glu Leu Pro Ile
        995                 1000                1005
Thr Phe Pro Asn Leu Asp Tyr Ser Glu Cys Cys Leu Phe Ser Asp Glu
    1010                1015                1020
Asp
1025
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<210> 8
<211> 3365
<212> DNA
<213> homo sapiens

<400> 8

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cctgcttctc taagtgggca gcggacagcg gcacgcacat ttcacctgtc ccgcagacaa 120
cagcaccatc tgcttgggag aaccctctcc cttctctgag aaagaaagat gtcgaatggg 180
tattccacag acgagaattt ccgctatctc atctcgtgct tcagggccag ggtgaaaatg 240
tacatccagg tggagcctgt gctggactac ctgacctttc tgcctgcaga ggtgaaggag 300
cagattcaga ggacagtcgc cacctccggg aacatgcagg cagttgaact gctgctgagc 360
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agaaccggca gccctctggc cgcccgctac atgaaccctg agctcacgga cttgccctct 480
ccatcgtttg agaacgctca tgatgaatat ctccaactgc tgaacctcct tcagcccact 540
ctggtggaca agcttctagt tagagacgtc ttggataagt gcatggagga ggaactgttg 600
acaattgaag acagaaaccg gattgctgct gcagaaaaca atggaaatga atcaggtgta 660
agagagctac taaaaaggat tgtgcagaaa gaaaactggt tctctgcatt tctgaatgtt 720
cttcgtcaaa caggaaacaa tgaacttgtc caagagttaa caggctctga ttgctcagaa 780
agcaatgcag agattgagaa tttatcacaa gttgatggtc ctcaagtgga agagcaactt 840
ctttcaacca cagttcagcc aaatctggag aaggaggtct ggggcatgga gaataactca 900
tcagaatcat cttttgcaga ttcttctgta gtttcagaat cagacacaag tttggcagaa 960
ggaagtgtca gctgcttaga tgaaagtctt ggacataaca gcaacatggg cagtgattca 1020
ggcaccatgg gaagtgattc agatgaagag aatgtggcag caagagcatc cccggagcca 1080
gaactccagc tcaggcctta ccaaatggaa gttgcccagc cagccttgga agggaagaat 1140
atcatcatct gcctccctac agggagtgga aaaaccagag tggctgttta cattgccaag 1200
gatcacttag acaagaagaa aaaagcatct gagcctggaa aagttatagt tcttgtcaat 1260
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aaggtactgc tagttgaaca gctcttccgc aaggagttcc aaccattttt gaagaaatgg 1320
tatcgtgtta ttggattaag tggtgatacc caactgaaaa tatcatttcc agaagttgtc 1380
aagtcctgtg atattattat cagtacagct caaatccttg aaaactccct cttaaacttg 1440
gaaaatggag aagatgctgg tgttcaattg tcagactttt ccctcattat cattgatgaa 1500
tgtcatcaca ccaacaaaga agcagtgtat aataacatca tgaggcatta tttgatgcag 1560
aagttgaaaa acaatagact caagaaagaa aacaaaccag tgattcccct tcctcagata 1620
ctgggactaa cagcttcacc tggtgttgga ggggccacga agcaagccaa agctgaagaa 1680
cacattttaa aactatgtgc caatcttgat gcatttacta ttaaaactgt taaagaaaac 1740
cttgatcaac tgaaaaacca aatacaggag ccatgcaaga agtttgccat tgcagatgca 1800
accagagaag atccatttaa agagaaactt ctagaaataa tgacaaggat tcaaacttat 1860
tgtcaaatga gtccaatgtc agattttgga actcaaccct atgaacaatg ggccattcaa 1920
atggaaaaaa aagctgcaaa agaaggaaat cgcaaagaac gtgtttgtgc agaacatttg 1980
aggaagtaca atgaggccct acaaattaat gacacaattc gaatgataga tgcgtatact 2040
catcttgaaa ctttctataa tgaagagaaa gataagaagt ttgcagtcat agaagatgat 2100
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aaaatgttga aaaggctggc tgaaaaccca gaatatgaaa atgaaaagct gaccaaatta 2280
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acaaaaacac gacagagtgc atatgcgctt tcccagtgga ttactgaaaa tgaaaaattt 2400
gctgaagtag gagtcaaagc ccaccatctg attggagctg gacacagcag tgagttcaaa 2460
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aaaccagagg agtatgctca taagattttg gaattacaga tgcaaagtat aatggaaaag 2820
aaaatgaaaa ccaagagaaa tattgccaag cattacaaga ataacccatc actaataact 2880
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gaattaccta tcacatttcc caatcttgac tattcagaat gctgtttatt tagtgatgag 3240
gattagcact tgattgaaga ttcttttaaa atactatcag ttaaacattt aatatgatta 3300
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ctctg                                                             3365
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<210> 9
<211> 1025
<212> PRT
<213> homo sapiens

<400> 9

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Cys Phe Arg Ala Arg Val Lys Met Tyr Ile Gln Val Glu Pro Val Leu
            20                  25                  30
Asp Tyr Leu Thr Phe Leu Pro Ala Glu Val Lys Glu Gln Ile Gln Arg
        35                  40                  45
Thr Val Ala Thr Ser Gly Asn Met Gln Ala Val Glu Leu Leu Leu Ser
    50                  55                  60
Thr Leu Glu Lys Gly Val Trp His Leu Gly Trp Thr Arg Glu Phe Val
65                  70                  75                  80
Glu Ala Leu Arg Arg Thr Gly Ser Pro Leu Ala Ala Arg Tyr Met Asn
                85                  90                  95
Pro Glu Leu Thr Asp Leu Pro Ser Pro Ser Phe Glu Asn Ala His Asp
            100                 105                 110
```

```
Glu Tyr Leu Gln Leu Leu Asn Leu Leu Gln Pro Thr Leu Val Asp Lys
        115                 120                 125
Leu Leu Val Arg Asp Val Leu Asp Lys Cys Met Glu Glu Glu Leu Leu
    130                 135                 140
Thr Ile Glu Asp Arg Asn Arg Ile Ala Ala Ala Glu Asn Asn Gly Asn
145                 150                 155                 160
Glu Ser Gly Val Arg Glu Leu Leu Lys Arg Ile Val Gln Lys Glu Asn
                165                 170                 175
Trp Phe Ser Ala Phe Leu Asn Val Leu Arg Gln Thr Gly Asn Asn Glu
            180                 185                 190
Leu Val Gln Glu Leu Thr Gly Ser Asp Cys Ser Glu Ser Asn Ala Glu
        195                 200                 205
Ile Glu Asn Leu Ser Gln Val Asp Gly Pro Gln Val Glu Glu Gln Leu
    210                 215                 220
Leu Ser Thr Thr Val Gln Pro Asn Leu Glu Lys Glu Val Trp Gly Met
225                 230                 235                 240
Glu Asn Asn Ser Ser Glu Ser Ser Phe Ala Asp Ser Ser Val Val Ser
                245                 250                 255
Glu Ser Asp Thr Ser Leu Ala Glu Gly Ser Val Ser Cys Leu Asp Glu
            260                 265                 270
Ser Leu Gly His Asn Ser Asn Met Gly Ser Asp Ser Gly Thr Met Gly
        275                 280                 285
Ser Asp Ser Asp Glu Glu Asn Val Ala Ala Arg Ala Ser Pro Glu Pro
    290                 295                 300
Glu Leu Gln Leu Arg Pro Tyr Gln Met Glu Val Ala Gln Pro Ala Leu
305                 310                 315                 320
Glu Gly Lys Asn Ile Ile Ile Cys Leu Pro Thr Gly Ser Gly Lys Thr
                325                 330                 335
Arg Val Ala Val Tyr Ile Ala Lys Asp His Leu Asp Lys Lys Lys Lys
            340                 345                 350
Ala Ser Glu Pro Gly Lys Val Ile Val Leu Val Asn Lys Val Leu Leu
        355                 360                 365
Val Glu Gln Leu Phe Arg Lys Glu Phe Gln Pro Phe Leu Lys Lys Trp
    370                 375                 380
Tyr Arg Val Ile Gly Leu Ser Gly Asp Thr Gln Leu Lys Ile Ser Phe
385                 390                 395                 400
Pro Glu Val Val Lys Ser Cys Asp Ile Ile Ile Ser Thr Ala Gln Ile
                405                 410                 415
Leu Glu Asn Ser Leu Leu Asn Leu Glu Asn Gly Glu Asp Ala Gly Val
            420                 425                 430
Gln Leu Ser Asp Phe Ser Leu Ile Ile Ile Asp Glu Cys His His Thr
        435                 440                 445
Asn Lys Glu Ala Val Tyr Asn Asn Ile Met Arg His Tyr Leu Met Gln
    450                 455                 460
Lys Leu Lys Asn Asn Arg Leu Lys Lys Glu Asn Lys Pro Val Ile Pro
465                 470                 475                 480
Leu Pro Gln Ile Leu Gly Leu Thr Ala Ser Pro Gly Val Gly Gly Ala
                485                 490                 495
Thr Lys Gln Ala Lys Ala Glu Glu His Ile Leu Lys Leu Cys Ala Asn
            500                 505                 510
Leu Asp Ala Phe Thr Ile Lys Thr Val Lys Glu Asn Leu Asp Gln Leu
        515                 520                 525
Lys Asn Gln Ile Gln Glu Pro Cys Lys Lys Phe Ala Ile Ala Asp Ala
    530                 535                 540
Thr Arg Glu Asp Pro Phe Lys Glu Lys Leu Leu Glu Ile Met Thr Arg
545                 550                 555                 560
Ile Gln Thr Tyr Cys Gln Met Ser Pro Met Ser Asp Phe Gly Thr Gln
```

```
                565                 570                 575
Pro Tyr Glu Gln Trp Ala Ile Gln Met Glu Lys Lys Ala Ala Lys Glu
            580                 585                 590
Gly Asn Arg Lys Glu Arg Val Cys Ala Glu His Leu Arg Lys Tyr Asn
        595                 600                 605
Glu Ala Leu Gln Ile Asn Asp Thr Ile Arg Met Ile Asp Ala Tyr Thr
    610                 615                 620
His Leu Glu Thr Phe Tyr Asn Glu Glu Lys Asp Lys Lys Phe Ala Val
625                 630                 635                 640
Ile Glu Asp Asp Ser Asp Glu Gly Gly Asp Asp Glu Tyr Cys Asp Gly
                645                 650                 655
Asp Glu Asp Glu Asp Asp Leu Lys Lys Pro Leu Lys Leu Asp Glu Thr
            660                 665                 670
Asp Arg Phe Leu Met Thr Leu Phe Phe Glu Asn Asn Lys Met Leu Lys
        675                 680                 685
Arg Leu Ala Glu Asn Pro Glu Tyr Glu Asn Glu Lys Leu Thr Lys Leu
    690                 695                 700
Arg Asn Thr Ile Met Glu Gln Tyr Thr Arg Thr Glu Glu Ser Ala Arg
705                 710                 715                 720
Gly Ile Ile Phe Thr Lys Thr Arg Gln Ser Ala Tyr Ala Leu Ser Gln
                725                 730                 735
Trp Ile Thr Glu Asn Glu Lys Phe Ala Glu Val Gly Val Lys Ala His
            740                 745                 750
His Leu Ile Gly Ala Gly His Ser Ser Glu Phe Lys Pro Met Thr Gln
        755                 760                 765
Asn Glu Gln Lys Glu Val Ile Ser Lys Phe Arg Thr Gly Lys Ile Asn
    770                 775                 780
Leu Leu Ile Ala Thr Thr Val Ala Glu Glu Gly Leu Asp Ile Lys Glu
785                 790                 795                 800
Cys Asn Ile Val Ile Arg Tyr Gly Leu Val Thr Asn Glu Ile Ala Met
                805                 810                 815
Val Gln Ala Arg Gly Arg Ala Arg Ala Asp Glu Ser Thr Tyr Val Leu
            820                 825                 830
Val Ala His Ser Gly Ser Gly Val Ile Glu His Glu Thr Val Asn Asp
        835                 840                 845
Phe Arg Glu Lys Met Met Tyr Lys Ala Ile His Cys Val Gln Asn Met
    850                 855                 860
Lys Pro Glu Glu Tyr Ala His Lys Ile Leu Glu Leu Gln Met Gln Ser
865                 870                 875                 880
Ile Met Glu Lys Lys Met Lys Thr Lys Arg Asn Ile Ala Lys His Tyr
                885                 890                 895
Lys Asn Asn Pro Ser Leu Ile Thr Phe Leu Cys Lys Asn Cys Ser Val
            900                 905                 910
Leu Ala Cys Ser Gly Glu Asp Ile His Val Ile Glu Lys Met His His
        915                 920                 925
Val Asn Met Thr Pro Glu Phe Lys Glu Leu Tyr Ile Val Arg Glu Asn
    930                 935                 940
Lys Ala Leu Gln Lys Lys Cys Ala Asp Tyr Gln Ile Asn Gly Glu Ile
945                 950                 955                 960
Ile Cys Lys Cys Gly Gln Ala Trp Gly Thr Met Met Val His Lys Gly
                965                 970                 975
Leu Asp Leu Pro Cys Leu Lys Ile Arg Asn Phe Val Val Val Phe Lys
            980                 985                 990
Asn Asn Ser Thr Lys Lys Gln Tyr Lys Lys Trp Val Glu Leu Pro Ile
        995                 1000                1005
Thr Phe Pro Asn Leu Asp Tyr Ser Glu Cys Cys Leu Phe Ser Asp Glu
    1010                1015                1020
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Asp
1025

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<213> Artificial Sequence

<220>
<223> synthetic oligonucleotide

<400> 10
tcactaatcc tcatcactaa ataaacagc 29

<210> 11
<211> 27
<212> DNA
<213> Artificial Sequence

<220>
<223> synthetic oligonucleotide

<400> 11
ttttttttt ttcagagtaa aacaatc 27

<210> 12
<211> 486
<212> PRT
<213> homo sapiens

<400> 12
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Gly Lys Asn Ile Ile Ile Trp Leu Pro Thr Gly Ala Gly Lys Thr Arg
20 25 30
Ala Ala Ala Tyr Val Ala Lys Arg His Leu Glu Thr Val Asp Gly Ala
35 40 45
Lys Val Val Val Leu Val Asn Arg Val His Leu Val Thr Gln His Gly
50 55 60
Glu Glu Phe Arg Arg Met Leu Asp Gly Arg Trp Thr Val Thr Thr Leu
65 70 75 80
Ser Gly Asp Met Gly Pro Arg Ala Gly Phe Gly His Leu Ala Arg Cys
85 90 95
His Asp Leu Leu Ile Cys Thr Ala Glu Leu Leu Gln Met Ala Leu Thr
100 105 110
Ser Pro Glu Glu Glu Glu His Val Glu Leu Thr Val Phe Ser Leu Ile
115 120 125
Val Val Asp Glu Cys His His Thr His Lys Asp Thr Val Tyr Asn Val
130 135 140
Ile Met Ser Gln Tyr Leu Glu Leu Lys Leu Gln Arg Ala Gln Pro Leu
145 150 155 160
Pro Gln Val Leu Gly Leu Thr Ala Ser Pro Gly Thr Gly Gly Ala Ser
165 170 175
Lys Leu Asp Gly Ala Ile Asn His Val Leu Gln Leu Cys Ala Asn Leu
180 185 190
Asp Thr Trp Cys Ile Met Ser Pro Gln Asn Cys Cys Pro Gln Leu Gln

```
        195                 200                 205
Glu His Ser Gln Gln Pro Cys Lys Gln Tyr Asn Leu Cys His Arg Arg
    210                 215                 220
Ser Gln Asp Pro Phe Gly Asp Leu Leu Lys Lys Leu Met Asp Gln Ile
225                 230                 235                 240
His Asp His Leu Glu Met Pro Glu Leu Ser Arg Lys Phe Gly Thr Gln
                245                 250                 255
Met Tyr Glu Gln Gln Val Val Lys Leu Ser Glu Ala Ala Ala Leu Ala
            260                 265                 270
Gly Leu Gln Glu Gln Arg Val Tyr Ala Leu His Leu Arg Arg Tyr Asn
        275                 280                 285
Asp Ala Leu Leu Ile His Asp Thr Val Arg Ala Val Asp Ala Leu Ala
    290                 295                 300
Ala Leu Gln Asp Phe Tyr His Arg Glu His Val Thr Lys Thr Gln Ile
305                 310                 315                 320
Leu Cys Ala Glu Arg Arg Leu Leu Ala Leu Phe Asp Asp Arg Lys Asn
                325                 330                 335
Glu Leu Ala His Leu Ala Thr His Gly Pro Glu Asn Pro Lys Leu Glu
            340                 345                 350
Met Leu Glu Lys Ile Leu Gln Arg Gln Phe Ser Ser Ser Asn Ser Pro
        355                 360                 365
Arg Gly Ile Ile Phe Thr Arg Thr Arg Gln Ser Ala His Ser Leu Leu
    370                 375                 380
Leu Trp Leu Gln Gln Gln Gln Gly Leu Gln Thr Val Asp Ile Arg Ala
385                 390                 395                 400
Gln Leu Leu Ile Gly Ala Gly Asn Ser Ser Gln Ser Thr His Met Thr
                405                 410                 415
Gln Arg Asp Gln Gln Glu Val Ile Gln Lys Phe Gln Asp Gly Thr Leu
            420                 425                 430
Asn Leu Leu Val Ala Thr Ser Val Ala Glu Glu Gly Leu Asp Ile Pro
        435                 440                 445
His Cys Asn Val Val Val Arg Tyr Gly Leu Leu Thr Asn Glu Ile Ser
    450                 455                 460
Met Val Gln Ala Arg Gly Arg Ala Trp Ala Asp Gln Ser Val Tyr Ala
465                 470                 475                 480
Phe Val Ala Thr Glu Gly
                485
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<210> 13
<211> 514
<212> PRT
<213> sus scrofa

<400> 13

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Leu Pro Ala Gln Asn Gly Lys Asn Thr Ile Ile Cys Ala Pro Thr Gly
            20                  25                  30
Cys Gly Lys Thr Phe Val Ser Leu Leu Ile Cys Glu His His Leu Lys
        35                  40                  45
Lys Phe Pro Arg Gly Arg Lys Gly Lys Val Val Phe Phe Ala Ile Gln
    50                  55                  60
Leu Pro Val Tyr Glu Gln Gln Lys Ser Val Phe Ser Lys His Phe Glu
65                  70                  75                  80
Arg Leu Gly Tyr Lys Val Ala Gly Ile Ser Gly Ala Thr Ser Asp Thr
                85                  90                  95
```

```
Val Cys Val Glu Gln Ile Val Glu Asn Ser Asp Ile Ile Ile Leu Thr
            100                 105                 110
Pro Gln Ile Leu Val Asn Cys Leu Thr Asn Gly Thr Ile Pro Ser Leu
        115                 120                 125
Ser Val Phe Thr Leu Met Ile Phe Asp Glu Cys His Asn Thr Ser Lys
    130                 135                 140
Gln His Pro Tyr Asn Val Ile Met Phe Ser Tyr Leu Asp Arg Lys Leu
145                 150                 155                 160
Gly Gly Ser Ser Asp Ser Leu Pro Gln Val Ile Gly Leu Thr Ala Ser
                165                 170                 175
Val Gly Val Gly Asp Ala Lys Asn Lys Ala Glu Ala Thr Glu Tyr Ile
            180                 185                 190
Cys Lys Leu Cys Ala Ser Leu Asp Thr Ser Val Ile Ala Thr Val Arg
        195                 200                 205
Asp Asn Leu Glu Glu Leu Glu Glu Val Val Tyr Lys Pro Gln Lys Phe
    210                 215                 220
Phe Arg Lys Val Glu Leu Arg Thr Thr Asp Arg Phe Lys Cys Ile Ile
225                 230                 235                 240
Ser Gln Leu Met Met Glu Ile Glu Ser Leu Ala Lys Ser Ile Phe Glu
                245                 250                 255
Glu Leu Gly Thr Ile Thr Leu Gly Gly Leu Phe Gln Ile Gln Asn Ser
            260                 265                 270
Asn Phe Gly Thr Gln Lys Tyr Glu Gln Trp Ile Val Lys Val Gln Lys
        275                 280                 285
Glu Cys Ala Val Phe Gln Met Pro Asp Lys Asp Lys Glu Ser Arg Ile
    290                 295                 300
Cys Lys Ala Leu Phe Ser Tyr Met Ser His Leu Arg Ile Tyr Asn Asp
305                 310                 315                 320
Ala Leu Ile Ile Asn Glu His Ala Arg Met Lys Asp Ala Leu Asp Tyr
                325                 330                 335
Leu Lys Asp Phe Phe Arg Asn Ile Arg Ala Ala Gly Phe Asp Glu Ile
            340                 345                 350
Glu Gln Asp Leu Thr Gln Arg Phe Glu Glu Lys Leu Gln Glu Leu Glu
        355                 360                 365
Ser Ile Ser Ile Asp Pro Ser Asn Glu Asn Pro Lys Leu Arg Asp Leu
    370                 375                 380
Cys Phe Ile Leu Gln Glu Glu Tyr His Leu Asn Pro Glu Thr Arg Thr
385                 390                 395                 400
Ile Leu Phe Val Lys Thr Arg Ala Leu Val Asp Ala Leu Lys Lys Trp
                405                 410                 415
Ile Lys Glu Asn Pro Lys Leu Ser Phe Leu Lys Pro Ser Ile Leu Thr
            420                 425                 430
Gly Arg Gly Lys Thr Asn Gln Asn Ile Gly Met Thr Leu Pro Ala Gln
        435                 440                 445
Lys Cys Val Leu Asp Thr Phe Arg Thr Asp Lys Asp Asn Lys Ile Leu
    450                 455                 460
Ile Thr Thr Ser Val Ala Asp Glu Gly Ile Asp Ile Ala Gln Cys Asn
465                 470                 475                 480
Leu Val Ile Leu Tyr Glu Tyr Val Gly Asn Val Ile Lys Met Ile Gln
                485                 490                 495
Thr Arg Gly Arg Gly Arg Ala Arg Gly Ser Lys Cys Phe Leu Leu Thr
            500                 505                 510
Ala Asn
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<210> 14

<211> 416
<212> PRT
<213> homo sapiens

<400> 14
Asn Leu Tyr Ser Pro Phe Lys Pro Arg Asn Tyr Gln Leu Glu Leu Ala
 1   5   10   15
Leu Pro Ala Met Lys Gly Lys Asn Thr Ile Ile Cys Ala Pro Thr Gly
            20   25   30
Cys Phe Lys Thr Phe Val Ser Leu Leu Ile Cys Glu His His Leu Lys
        35   40   45
Lys Phe Pro Gln Gly Gln Lys Gly Lys Val Val Phe Phe Ala Asn Gln
    50   55   60
Ile Pro Val Tyr Glu Gln Gln Lys Ser Val Phe Ser Lys Tyr Phe Glu
65   70   75   80
Arg His Gly Tyr Arg Val Thr Gly Ile Ser Gly Ala Thr Ala Glu Asn
                85   90   95
Val Pro Val Glu Gln Ile Val Glu Asn Asn Asp Ile Ile Ile Leu Thr
            100   105   110
Pro Gln Ile Leu Val Asn Asn Leu Lys Lys Gly Thr Ile Pro Ser Leu
        115   120   125
Ser Ile Phe Thr Leu Met Ile Phe Asp Glu Cys His Asn Thr Ser Lys
    130   135   140
Gln His Pro Tyr Asn Met Ile Met Phe Asn Tyr Leu Asp Gln Lys Leu
145   150   155   160
Gly Gly Ser Ser Gly Pro Leu Pro Gln Val Ile Gly Leu Thr Ala Ser
                165   170   175
Val Gly Val Gly Asp Ala Lys Asn Thr Asp Glu Ala Leu Asp Tyr Ile
            180   185   190
Cys Lys Leu Cys Ala Ser Val Ile Ala Thr Val Lys His Asn Leu Glu
        195   200   205
Glu Leu Glu Gln Val Val Tyr Lys Pro Gln Lys Phe Phe Arg Lys Val
    210   215   220
Glu Ser Arg Ile Ser Asp Lys Phe Lys Tyr Ile Ile Ala Gln Leu Met
225   230   235   240
Arg Asp Thr Glu Ser Leu Ala Lys Arg Ile Cys Lys Asp Leu Glu Asn
                245   250   255
Leu Ser Gln Ile Gln Asn Arg Glu Lys Leu Gln Glu Leu Glu Ser Val
            260   265   270
Ser Arg Asp Pro Ser Asn Glu Asn Pro Lys Leu Glu Asp Leu Cys Phe
        275   280   285
Ile Leu Gln Glu Glu Tyr His Leu Asn Pro Glu Thr Ile Thr Ile Leu
    290   295   300
Phe Val Lys Thr Arg Ala Leu Val Asp Ala Leu Lys Asn Trp Ile Glu
305   310   315   320
Gly Asn Pro Lys Leu Ser Phe Leu Lys Pro Gly Ile Leu Thr Gly Arg
                325   330   335
Gly Lys Thr Asn Gln Asn Thr Gly Met Thr Leu Pro Ala Gln Lys Cys
            340   345   350
Ile Leu Asp Ala Phe Lys Ala Ser Gly Asp His Asn Ile Leu Ile Ala
        355   360   365
Thr Ser Val Ala Asp Glu Gly Ile Asp Ile Ala Gln Cys Asn Leu Val
    370   375   380
Ile Leu Tyr Glu Tyr Val Gly Asn Val Ile Lys Met Ile Gln Thr Arg
385   390   395   400
Gly Arg Gly Arg Ala Arg Gly Ser Lys Cys Phe Leu Leu Thr Ser Asn
                405   410   415

<210> 15
<211> 503
<212> PRT
<213> caenorhabditis elegans

<400> 15
Ala Asp Leu Gln Cys Phe Asn Pro Arg Asp Tyr Gln Val Glu Leu Leu
 1   5   10   15
Asp Lys Ala Thr Lys Lys Asn Thr Ile Val Gln Leu Gly Thr Gly Ser
            20   25   30
Gly Lys Thr Phe Ile Ala Val Leu Leu Leu Lys Glu Tyr Gly Val Gln
        35   40   45
Leu Phe Ala Pro Leu Asp Gln Gly Gly Lys Arg Ala Phe Phe Val Val
    50   55   60
Glu Lys Val Asn Leu Val Glu Gln Gln Ala Ile His Ile Glu Val His
65   70   75   80
Thr Ser Phe Lys Val Gly Gln Val His Gly Gln Thr Ser Ser Gly Leu
                85   90   95
Trp Asp Ser Lys Glu Gln Cys Asp Gln Phe Met Lys Arg His His Val
            100   105   110
Val Val Ile Thr Ala Gln Cys Leu Leu Asp Leu Ile Arg His Ala Tyr
        115   120   125
Leu Lys Ile Glu Asp Met Cys Val Leu Ile Phe Asp Glu Cys His His
    130   135   140
Ala Leu Gly Ser Gln His Pro Tyr Arg Ser Ile Met Val Asp Tyr Lys
145   150   155   160
Leu Leu Lys Lys Asp Lys Pro Val Pro Arg Val Leu Gly Leu Thr Ala
                165   170   175
Ser Leu Ile Lys Ala Lys Val Ala Pro Glu Lys Leu Met Glu Gln Leu
            180   185   190
Lys Lys Leu Glu Ser Ala Met Asp Ser Val Ile Glu Thr Ala Ser Asp
        195   200   205
Leu Val Ser Leu Ser Lys Tyr Gly Ala Lys Pro Tyr Glu Val Val Ile
    210   215   220
Ile Cys Lys Asp Phe Glu Ile Gly Cys Leu Gly Ile Pro Asn Phe Asp
225   230   235   240
Thr Val Ile Glu Ile Phe Asp Glu Thr Val Ala Phe Val Asn Thr Thr
                245   250   255
Thr Glu Phe His Pro Asp Leu Asp Leu Asp Pro Arg Arg Pro Ile Lys
            260   265   270
Asp Ser Leu Lys Thr Thr Arg Ala Val Phe Arg Gln Leu Gly Pro Trp
        275   280   285
Ala Ala Trp Arg Thr Ala Gln Val Trp Glu Lys Glu Leu Gly Lys Ile
    290   295   300
Ile Lys Ser Gln Val Leu Pro Asp Lys Thr Leu Arg Phe Leu Asn Met
305   310   315   320
Ala Lys Thr Ser Met Ile Thr Ile Lys Arg Leu Leu Glu Pro Glu Met
                325   330   335
Lys Lys Ile Lys Ser Ile Glu Ala Leu Arg Pro Tyr Val Pro Gln Arg
            340   345   350
Val Ile Arg Leu Phe Glu Ile Leu Glu Thr Phe Asn Pro Glu Phe Gln
        355   360   365
Lys Glu Arg Met Lys Leu Glu Lys Ala Glu His Leu Ser Ala Ile Ile
    370   375   380
Phe Val Asp Gln Arg Tyr Ile Ala Tyr Ser Leu Leu Leu Met Met Arg

```
385                 390                 395                 400
His Ile Lys Ser Trp Glu Pro Lys Phe Lys Phe Val Asn Pro Asp Tyr
                405                 410                 415
Val Val Gly Ala Ser Gly Arg Asn Leu Ala Ser Ser Asp Ser Gln Gly
            420                 425                 430
Leu His Lys Arg Gln Thr Glu Val Leu Arg Arg Phe His Arg Asn Glu
        435                 440                 445
Ile Asn Cys Leu Ile Ala Thr Ser Val Leu Glu Glu Gly Val Asp Val
    450                 455                 460
Lys Gln Cys Asn Leu Val Ile Lys Phe Asp Arg Pro Leu Asp Met Arg
465                 470                 475                 480
Ser Tyr Val Gln Ser Lys Gly Arg Ala Arg Arg Ala Gly Ser Arg Tyr
                485                 490                 495
Val Ile Thr Val Glu Glu Lys
            500
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<210> 16
<211> 549
<212> PRT
<213> arabidopsis thaliana

<400> 16

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Glu Lys Val Val Glu Glu Gln Ala Arg Arg Tyr Gln Leu Asp Val Leu
 1               5                  10                  15
Glu Gln Ala Lys Ala Lys Asn Thr Ile Ala Phe Leu Glu Thr Gly Ala
            20                  25                  30
Gly Lys Thr Leu Ile Ala Ile Leu Leu Ile Lys Ser Val His Lys Asp
        35                  40                  45
Leu Met Ser Gln Asn Arg Lys Met Leu Ser Val Phe Leu Val Pro Lys
    50                  55                  60
Val Pro Leu Val Tyr Gln Gln Ala Glu Val Ile Arg Asn Gln Thr Cys
65                  70                  75                  80
Phe Gln Val Gly His Tyr Cys Gly Glu Met Gly Gln Asp Phe Trp Asp
                85                  90                  95
Ser Arg Arg Trp Gln Arg Glu Phe Glu Ser Lys Gln Val Leu Val Met
            100                 105                 110
Thr Ala Gln Ile Leu Leu Asn Ile Leu Arg His Ser Ile Ile Arg Met
        115                 120                 125
Glu Thr Ile Asp Leu Leu Ile Leu Asp Glu Cys His His Ala Val Lys
    130                 135                 140
Lys His Pro Tyr Ser Leu Val Met Ser Glu Phe Tyr His Thr Thr Pro
145                 150                 155                 160
Lys Asp Lys Arg Pro Ala Ile Phe Gly Met Thr Ala Ser Pro Val Asn
                165                 170                 175
Leu Lys Gly Val Ser Ser Gln Val Asp Cys Ala Ile Lys Ile Arg Asn
            180                 185                 190
Leu Glu Thr Lys Leu Asp Ser Thr Val Cys Thr Ile Lys Asp Arg Lys
        195                 200                 205
Glu Leu Glu Lys His Val Pro Met Pro Ser Glu Ile Val Val Glu Tyr
    210                 215                 220
Asp Lys Ala Ala Thr Met Trp Ser Leu His Glu Thr Ile Lys Gln Met
225                 230                 235                 240
Ile Ala Ala Val Glu Glu Ala Ala Gln Ala Ser Ser Arg Lys Ser Lys
                245                 250                 255
Trp Gln Phe Met Gly Ala Arg Asp Ala Gly Ala Lys Asp Glu Leu Arg
            260                 265                 270
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Gln Val Tyr Gly Val Ser Glu Arg Thr Glu Ser Asp Gly Ala Ala Asn
        275                 280                 285
Leu Ile His Lys Leu Arg Ala Ile Asn Tyr Thr Leu Ala Glu Leu Gly
    290                 295                 300
Gln Trp Cys Ala Tyr Lys Val Gly Gln Ser Phe Leu Ser Ala Leu Gln
305                 310                 315                 320
Ser Asp Glu Arg Val Asn Phe Gln Val Asp Val Lys Phe Gln Glu Ser
                325                 330                 335
Tyr Leu Ser Glu Val Val Ser Leu Leu Gln Cys Glu Leu Leu Glu Gly
            340                 345                 350
Ala Ala Ala Glu Lys Val Ala Ala Glu Val Gly Lys Pro Glu Asn Gly
        355                 360                 365
Asn Ala His Asp Glu Met Glu Glu Gly Glu Leu Pro Asp Asp Pro Val
    370                 375                 380
Val Ser Gly Gly Glu His Val Asp Glu Val Ile Gly Ala Ala Val Ala
385                 390                 395                 400
Asp Gly Lys Val Thr Pro Lys Val Gln Ser Leu Ile Lys Leu Leu Leu
                405                 410                 415
Lys Tyr Gln His Thr Ala Asp Phe Arg Ala Ile Val Phe Val Glu Arg
            420                 425                 430
Val Val Ala Ala Leu Val Leu Pro Lys Val Phe Ala Glu Leu Pro Ser
        435                 440                 445
Leu Ser Phe Ile Arg Cys Ala Ser Met Ile Gly His Asn Asn Ser Gln
    450                 455                 460
Glu Met Lys Ser Ser Gln Met Gln Asp Thr Ile Ser Lys Phe Arg Asp
465                 470                 475                 480
Gly His Val Thr Leu Leu Val Ala Thr Ser Val Ala Glu Glu Gly Leu
                485                 490                 495
Asp Ile Arg Gln Cys Asn Val Val Met Arg Phe Asp Leu Ala Lys Thr
            500                 505                 510
Val Leu Ala Tyr Ile Gln Ser Arg Gly Arg Ala Arg Lys Pro Gly Ser
        515                 520                 525
Asp Tyr Ile Leu Met Val Glu Arg Gly Asn Val Ser His Ala Ala Phe
    530                 535                 540
Leu Arg Asn Ala Arg
545
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<210> 17
<211> 485
<212> PRT
<213> schizosaccharomyces pombe

<400> 17

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Ser Phe Leu Leu Pro Gln Leu Leu Arg Lys Tyr Gln Gln Asp Val Tyr
 1               5                  10                  15
Asn Ile Ala Ser Lys Gln Asn Thr Leu Leu Val Met Arg Thr Gly Ala
            20                  25                  30
Gly Lys Thr Leu Leu Ala Val Lys Leu Ile Lys Gln Lys Leu Glu Glu
        35                  40                  45
Gln Ile Leu Ile Gln Glu Ser Asn Leu Glu His Lys Lys Ile Ser Val
    50                  55                  60
Phe Leu Val Asn Lys Val Pro Leu Val Phe Gln Gln Ala Glu Tyr Ile
65                  70                  75                  80
Arg Ser Gln Leu Pro Ala Lys Val Gly Met Phe Tyr Gly Glu Leu Ser
                85                  90                  95
Ile Glu Met Ser Glu Gln Leu Leu Thr Asn Ile Ile Leu Lys Tyr Asn
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```
                100                 105                 110
Val Ile Val Ile Thr Ala Asp Leu Phe Tyr Leu Phe Leu Ala Arg Gly
        115                 120                 125
Phe Leu Ser Ile Asn Asp Leu Asn Leu Ile Ile Phe Asp Glu Cys His
    130                 135                 140
His Ala Ile Gly Asn Asp Ala Tyr Ala Arg Ile Met Asn Asp Phe Tyr
145                 150                 155                 160
His Arg Ala Lys Ala Val Leu Ser Lys Lys His Phe Thr Leu Pro Arg
                165                 170                 175
Ile Phe Gly Met Thr Ala Ser Pro Phe Thr Gly Lys Lys Gly Asn Leu
            180                 185                 190
Tyr His Arg Leu Tyr Gln Trp Glu Gln Leu Phe Asp Ser Lys Ala His
        195                 200                 205
Val Val Ser Glu Asn Glu Leu Ala Asp Tyr Phe Cys Leu Pro Glu Glu
    210                 215                 220
Ser Tyr Val Met Tyr Ser Asn Lys Leu Val Val Pro Pro Ser Asp Ser
225                 230                 235                 240
Ile Ile Lys Lys Cys Glu Glu Thr Leu Gln Gly Cys Lys Leu Ile Ser
                245                 250                 255
Arg Ala Val Lys Thr Ala Leu Ala Glu Thr Ile Asp Met Gly Leu Trp
            260                 265                 270
Phe Gly Glu Gln Val Trp Leu Tyr Leu Val Asp Phe Val Glu Thr Lys
        275                 280                 285
Arg Leu Lys Lys Lys Ala Leu Gly Lys Gln Leu Ser Asp Asp Glu Glu
    290                 295                 300
Leu Ala Ile Asp Arg Leu Lys Ile Phe Val Glu Asp Trp Lys Asn Asn
305                 310                 315                 320
Lys Tyr Ser Asp Asn Gly Pro Arg Ile Pro Val Phe Asp Ser Thr Asp
                325                 330                 335
Val Thr Asp Lys Val Phe Lys Leu Leu Glu Leu Leu Lys Ala Thr Tyr
            340                 345                 350
Arg Lys Ser Asp Ser Val Arg Thr Val Ile Phe Val Glu Arg Lys Ala
        355                 360                 365
Thr Ala Phe Thr Leu Ser Leu Phe Met Lys Thr Leu Asn Leu Pro Asn
    370                 375                 380
Ile Arg Ala His Ser Phe Ile Gly His Gly Pro Ser Asp Gln Gly Glu
385                 390                 395                 400
Phe Ser Met Thr Phe Arg Arg Gln Lys Asp Thr Leu His Lys Phe Lys
                405                 410                 415
Thr Gly Lys Tyr Asn Val Leu Ile Ala Thr Ala Val Ala Glu Glu Gly
            420                 425                 430
Ile Asp Val Pro Ser Cys Asn Leu Val Ile Arg Phe Asn Ile Cys Arg
        435                 440                 445
Thr Val Thr Gln Tyr Val Gln Ser Arg Gly Arg Ala Arg Ala Met Ala
    450                 455                 460
Ser Lys Phe Leu Ile Phe Leu Asn Thr Glu Glu Leu Leu Ile His Glu
465                 470                 475                 480
Arg Ile Leu His Glu
                485
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